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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/624,003

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Steven Shuyong Xiao

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7590

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EXAMINER

SARKAR, ASOK K

ART UNIT

PAPER NUMBER

2829

DATE MAILED: 02/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/624,003

Applicant(s)

XIAO ET AL.

Examiner

Asok K. Sarkar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,10 and 11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8 and 11 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 5 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Sturm, US 6,087,196.

Regarding claim 1, Sturm teaches a non-vacuum process for the fabrication of an electronic and opto-electronic device based on organic semiconductors comprising the steps of:

- a first electrode layer 46 using non-vacuum processing technique see Fig. 9A,
- forming at least one organic semiconductor material layer 50 using non-vacuum processing technique see Fig. 9B, and
- forming a second electrode layer 52 with reference to Fig. 9C in between column 5, line 64 and column 6, line 5. The process of ink-jet printing by Sturm is inherently a non-vacuum process.

Regarding claim 5, Sturm teaches a non-vacuum process wherein said first electrode layer is selected from a group of materials with low work functions such as Mg: Ag (column 4, line 66), whereas the second electrode layer is selected from a group of materials with high work functions such as ITO (column 4, line 17).

Regarding claim 11, Sturm teaches forming the light emitting diode device in

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column 1, lines 19 - 24.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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6. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturm, US 6,087,196 in view of Dimitrakopoulos, US 6,334,662 and Dubin, US 5,833,820.

Regarding these claims, Sturm teaches fabricating the electrode layers by a solution deposition process, but fails to teach fabrication of the electrode layers by an electrodeposition process in an aqueous phase or by processing techniques including spin coating, thermal transfer printing, spray and screen printing.

Dimitrakopoulos teaches that the electrode on an organic semiconductor layer for a semiconductor device can be deposited by either a solution deposition process such as spin coating or an electrodeposition process (see claim 6 in column 10).

Dubin teaches that electrodeposition is carried out in a plating solution for conventional electrodeposition process in column 9, line 7.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Sturm and deposit the electrodes by an electrodeposition process since the method of producing the electrode by an electrodeposition process is well known and functionally equivalent with the solution deposition process such as ink-jet printing or screen printing as taught by Dimitrakopoulos in claim 6 in column 10.

Similarly, it would have been also obvious to one with ordinary skill in the art at the time of the invention to modify Sturm and deposit the electrodes by an electrodeposition process in a plating solution since electrodeposition process is conventionally carried out in a plating solution as taught by Dubin in column 9, line 7.

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7. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturm, US 6,087,196 in view of Dubin, US 5,833,820.

Regarding these claims Sturm teaches depositing the electrode layers in a vacuum chamber to protect the electrodes from ambient contaminants in column 4, but fails to teach deposition in chambers containing inert gas and reducing agent to minimize contents of oxygen and water.

Dubin teaches a plating apparatus in which an inert gas such as nitrogen is flowed through in column 9, lines 6 – 10 for the benefit of plating the metal on the desired location.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Sturm and use the plating process taught by Dubin and use a combination of nitrogen and a reducing gas especially for depositing the low work function metal such as Mg:Ag or Al:Li since these metals are highly prone to oxidation thereby affecting their resistivity properties.

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sturm, US 6,087,196 in view of Dimitrakopoulos, US 6,334,662.

Sturm fails to teach forming the organic semiconductor layer are selected from a group of solution processing techniques of spin coating, screen printing, thermal transfer printing, spray and dip-coating.

Dimitrakopoulos teaches forming the organic semiconductor layer by processes such as spin coating, spraying and dip coating in addition to ink-jet printing and are all functionally equivalent in column 9, lines 4 – 10.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Sturm and deposit the organic semiconductor layer by printing, spray and dip-coating process since these processes are well known and functionally equivalent with the solution deposition process such as ink-jet printing or screen printing as taught by Dimitrakopoulos in column 9, lines 4 – 10.

Allowable Subject Matter

9. Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject Matter:

Claim 10 recites, inter alia, a method of forming a device in which the device is fabricated by separately forming a first part consisting of the first electrode coated with a layer of a first organic semiconductor material and forming a second part consisting of the second electrode coated with a layer of a second organic semiconductor material and assembling the two parts by aligning and sticking the two pads together by cross-linking the two organic semiconductor layers with the help of heating, light or electron radiation. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Response to Arguments

11. Applicant's arguments filed January 18, 2005 have been fully considered but they are not persuasive.

The Applicant's representative's first argument regarding claim 1 in page 8 is not persuasive. The rejections are based on the limitations of the claims. In the present situation the limitations of claim 1 are clearly anticipated by Sturm since Sturm teaches a non-vacuum process for fabrication of an electronic device by forming three layers, two electrode layers and an organic semiconductor layer. These steps are clearly anticipated by Sturm as shown in descriptions of Figs. 9A – 9C.

The Applicant's representative's second argument regarding claim 4 in page 8 is moot in view of the new rejection as described above.

The Applicant's representative's arguments regarding claims 5 and 8 in page 8 are not persuasive and are moot in view of the new rejection as described above. The limitations are about forming electrode layers without any restrictions to whether the electrodes are cathode or anode. Therefore, the order of placement of electrodes is not considered by the Examiner. Methods of placing a layer for forming a device are functionally equivalent since both Sturm and Dimitrakopoulos are forming an electronic device with an organic semiconductor.

The Applicant's representative's arguments regarding claim 11 in page 10 can be rebutted with the same arguments as was provided for claim 1.

The Applicant's representative's second part of arguments deals with the references of Dimitrakopoulos and Dubin arguing that these references do not teach

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electrodeposition of low work function metals and have different objectives. The arguments are not persuasive because the claims in question depend on the independent claim 1 that recites forming only two electrodes, and an organic layer for a semiconductor device. This objective is met by all references used in the rejection. Although, various references use different methods for forming the layers, the methods are all functionally equivalent as have been clearly described above during the present office action.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on 571 272 1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Asok Kumar Sarkar
Asok K. Sarkar
February 7, 2005

Primary Examiner